WHAT IS CLAIMED IS:

1. A method for extracting fingerprint feature data using a ridge orientation model, comprising the steps of:

a) scanning a fingerprint of a person requiring fingerprint recognition with a fingerprint acquisition device, and converting the fingerprint into a digital fingerprint image of predetermined format;

b) dividing the fingerprint image into a plurality of regions, each with a predetermined size, and calculating ridge orientations in the regions;

c) calculating qualities of ridges according to regions and separating the fingerprint image into a fingerprint region and a background region according to the calculated ridge qualities;

d) evaluating and extracting positions of a core and a delta in the fingerprint region and determining the positions of the core and the delta within and outside the fingerprint region from the extracted positions of the cores and deltas;

e) setting the determined positions as initial parameters of an initial ridge orientation model for the core and delta;

f) calculating a ridge orientation function by calculating parameters with a minimum error between ridge orientation values of the ridge orientation model and ridge orientation values of regions with quality higher than a threshold; and

g) calculating ridge orientation values in all regions using the ridge orientation function, and deciding and extracting the positions of the core and the delta from the parameters for core and delta of the ridge orientation function.

2. The method according to claim 1, wherein in the step c)

the ridge qualities are determined from a difference between a gray level difference of ridge orientation with a minimum gray level difference, and a gray level difference of ridge orientation with a maximum gray level difference, and

the fingerprint image is determined as a fingerprint region if both a gray level difference in a longitudinal orientation of ridges and a gray level difference in a lateral orientation of ridges are higher than a threshold, and is determined as a background region if both the gray level difference in the longitudinal orientation of ridges and the gray level difference in the lateral orientation of ridges are lower than the threshold.

3. The method according to claim 2, wherein the ridge orientation with the minimum gray level difference is determined to be the longitudinal orientation of the ridges, and the ridge orientation with the maximum gray level difference is determined as the lateral orientation of the ridges.

4. The method according to claim 1, wherein in step c) if the ridge quality corresponding to the background region is calculated in a fingerprint region, the region having the quality corresponding to the background region and surrounded by the fingerprint regions is processed as a fingerprint region but not a background region.

5. The method according to claim 1, wherein in step d), the positions of the core and the delta are extracted

by calculating a *Poincare* Index with respect to each point within a predetermined scope of the fingerprint region.

6. The method according to claim 5, wherein if any position of the core or the delta is not extracted, the scope of the fingerprint region for calculating the *Poincare* Index is expanded, thus a region with the core and delta positioned thereat to be exactly extracted.

7. The method according to claim 1, wherein in step d), if any core or delta is not positioned in the fingerprint region, the position of the core or the delta is calculated using the following Equation,

$$<O_e^2> = \int_R (O(z)-O_m(Z))^2 dz$$

where $g_k(\arg(z-z_k)) = -\frac{\pi}{2} - \arg(z-z_k)$, if z_k is the position of a delta,

$= \frac{\pi}{2} + \arg(z-z_k)$, if z_k is the position of a core, and

z is a complex value (x+yi) representing a single arbitrary position in a two-dimensional region, and z_k is a complex value representing the position of the core or the delta.

8. The method according to claim 7, wherein the positions of the core and the delta are determined by optimizing an error of the following Equation in a region with a ridge quality higher than a threshold, using a steepest descent method,

$$<O_e^2> = \int_R (O(z)-O_{m'}(z))^2 dz$$

where R is a region with a quality higher than the

threshold.

9. The method according to claim 1, wherein in step e) the initial ridge orientation model is set by the following Equation,

$$O_m(Z)=O_0+\frac{1}{2}\sum_{k=1}^{K} g_k(\arg(z-z_k);\, C_{k,1}, C_{k,2}, \cdots, C_{k,l})$$

where $g_k(\theta)=C_{k,l}+\dfrac{\theta-\theta_l}{2\pi/L}[C_{k,l+1}-C_{k,l}], \quad \theta_1 \le \theta \le \theta_{l+1}$

$$\theta=\arg(z-z_k);\theta_{k+1}-\theta_k=\frac{2\pi}{L};C_{k,l}=g_k(\theta_1),$$

$C_{k,l}=-\dfrac{\pi}{2}-\theta_l$, z_k is the position of a delta,

$C_{k,l}=\dfrac{\pi}{2}+\theta_l$, z_k is the position of a core,

and

O_0 is "0", z is a complex value (x+yi) representing a single arbitrary position in a two-dimensional region, z_k is a complex value representing the position of the core or the delta, K is the total number of cores or deltas, and L is a positive integer.

10. The method according to claim 1, wherein in step f) the ridge orientation function is determined by optimizing an error of the following Equation in a region with a ridge quality higher than a threshold, using a steepest descent method,

$$<O_e^2> = \int_R (O(z)-O_m(Z))^2 dz$$

where R is a region with a quality higher than the threshold.